

REMARKS

The Applicant wishes to express his gratitude for the Examiner's the indication that claims 3 and 6 would allowable if amended to incorporate the limitations of their respective base and intervening claims. In order to advance the present application to allowance, the Applicant has amended claims 3 and 6 to incorporate the limitation of claim 1.

In accordance with the Examiner's helpful suggestion, the Applicant has amended the Title. It is the Applicant's preference to continue to refer to a "Secondary Air Turbocharger," in order to highlight to the reader the distinction between secondary air and exhaust gas turbochargers. These differences are discussed further below. For this reason, the Applicant also prefers to consistently use this terminology throughout the Application, including in the claims. Accordingly, the Applicant respectfully requests the pending claim objection be reconsidered and withdrawn.

Differences Between Secondary Air And Exhaust Turbochargers:

The present invention relates to the special construction of a turbocharger as a secondary air turbocharger. As described in the specification and/or known in the art, secondary air turbochargers differ substantially in their construction, principles of operation and operating conditions from their exhaust gas turbocharger counterparts.

An exhaust gas turbocharger turbine is driven by high temperature, high pressure exhaust gases emitted by an internal combustion engine. The turbine in the hot gas flow path compresses intake air, which is fed into the engine's combustion chamber(s). As a rule, an exhaust gas turbocharger is installed in

the immediate vicinity of the engine, both to minimize loss of exhaust energy from cooling before the exhaust enters the exhaust turbocharger), and to ensure immediate availability of oil from the engine to cool and lubricate the turbocharger's highly stressed bearings. As to acoustical performance, the exhaust gas turbocharger noise is substantially dominated by high frequency pulsating in the exhaust gas flow.

In contrast, so-called secondary air turbochargers are being provided on some motor vehicle internal combustion engines to achieve, *inter alia*, improved emissions performance during cold starting and in the warming-up phase of the vehicle's motor. Such an additional secondary air turbocharger typically is not arranged in the exhaust line. It is instead separated in space from the actual internal combustion engine and is powered by an air flow which can be obtained, for example, from the pressure difference at a choke valve in the air intake passage.

Because the secondary air turbocharger does not have to survive in the extremely harsh environment of an exhaust gas turbocharger, it may be designed to entirely different design parameters in areas such as gas flow and bearing loading. A secondary air turbocharger further differs from an exhaust gas turbocharger in features which affect radiated noise performance. In a secondary air turbocharger, the powering air stream has a lower pressure potential than an exhaust gas stream, and thus less energy available to be dissipated as sound energy. Furthermore, the noise level of the air stream driving a secondary air turbocharger is low due to the absence of the very high

peak pressures found in exhaust streams.

Secondary air superchargers also differ in the frequency range of the radiated noise. Because the space in an engine compartment for a secondary air turbocharger is limited, it must be very small and light. As a result, in order to achieve the desired pumping power, the turbines are designed to operate at especially high turbine speeds, shifting the noise frequency to ranges far above exhaust gas turbochargers. Secondary air turbochargers also use roller turbine shaft bearings (due to the lack of available forced oil circulation from the engine as a result of their spatial separation), which have different noise characteristics than the oil-fed shaft bearings used in exhaust gas turbochargers.

In view of the foregoing fundamental differences in design and operating environments between exhaust gas and secondary air turbochargers, the approaches to noise suppression in one field of turbocharging cannot be assumed to be applicable to another type of turbocharger or vice-versa -- just as approaches to improving aircraft propeller blades are not obviously applicable to boat propeller designs, which operate in a completely different environment (high density incompressible fluid vs. very low pressure compressible gas).

Thus, it was a surprising discovery by the present inventors to find that, unlike exhaust gas turbochargers operating at very high temperatures, the operating noise of a secondary air turbocharger can be effectively reduced if at least a part of the turbocharger housing is surrounded externally, preferably in the vicinity of its rolling bearings, with a plastic foam insulating material for noise suppression (a material which could not be used with exhaust gas

turbochargers operating at several hundred degrees). Moreover, plastic foam, especially in the form of a synthetic resin foam such as a polyurethane foam, is very light, has high acoustical insulating properties and is easy to put into the desired form, unlike the high-temperature insulating materials which must be used with exhaust gas turbochargers.

Withdrawal of the §112 Rejections Is Respectfully Requested.

As noted above, secondary air turbochargers are distinctly different from exhaust gas turbochargers due to the design differences necessitated by their environments (*e.g.*, a high speed, roller bearing, non-engine oil-supplied secondary air turbocharger would be unsuitable in an exhaust gas turbocharger application). The Applicant therefore respectfully maintains that specific recitation of the claimed and described turbocharger as a secondary air turbocharger is an appropriate and sufficiently definite claim limitation. Reconsideration and withdrawal of the pending § 112 rejections is respectfully requested.

The Claims Are Patentable Over The Cited References.

Claims 1-2 and 7-9 stand rejected under 35 U.S.C. § 103(a) as unpatentable over U.S. Patent No. 3,845,619 to O'Neill ("O'Neill") in view of International patent document no. WO 97/48943 ("Wirth").

Claims 4-5 stand rejected under § 103(a) as unpatentable over O'Neill and Wirth, in further view of U.S. Patent No. 5,199,846 to Fukasaku, *et al.* ("Fukasaku").

Claims 10-11 stand rejected under § 103(a) as unpatentable over O'Neill

and Wirth, in further view of German patent document no. DE 100 22 052 C2
("Doll Manfred, *et al.*").

The Applicant respectfully traverses the pending § 103(a) rejections on the grounds that none of the cited references, either alone or in combination, teaches or suggests the present invention as recited in claim 1 and its dependent claims. The Applicant has amended claim 1 to more specifically recited that the acoustic insulation material is a "synthetic resin foam."

As a threshold matter, the O'Neill reference is cited as disclosing a turbocharger. However, the device shown in O'Neill Fig. 1 is a gas turbine engine (intake 1 feeding air into fuel combustion chamber 10 to drive the engine's power output shaft 6).

A gas turbine engine is simply not comparable in construction, operating principle and operating conditions to a secondary air turbocharger, and is non-analogous art which does not teach the device for which it is cited (a turbocharger). The pending rejection should be withdrawn on this ground alone.

Further, O'Neill is entirely concerned with *internal* thermal loads and heat transfer *out* of the gas turbine engine. This reference discusses *internal* thermal insulation *within* the gas turbine engine to shield the shaft bearings from the hot burner chamber gases being fed to the turbine blades. O'Neill at 2:25-26; Fig. 1 (thermal insulation 14 of the gas turbine 4 provided for reducing the heat stress on the bearings 11, 12 and 13). O'Neill then describes as his invention the addition of copper powder to the engine shaft to conduct heat away from turbine shaft bearings. *Id.* at 2:24-37. In this way, *O'Neill teaches away*

from the use of acoustic insulation, especially of the shaft bearings, as addition of such insulation would lead to no useful result *inside* a gas turbine, whose the main noise sources are from the hot gas flow and the engine's reduction/power transmission gears.

As to the combination of O'Neill and Wirth, setting aside O'Neill's general inapplicability, there is no suggestion or motivation in O'Neil or the Wirth reference for their combination to obtain the present invention, as recited: a secondary air turbocharger, with a synthetic resin foam sound insulation, located about the secondary air turbocharger's bearing area.

Wirth is cited as teaching thermal and sound insulation for diesel engine turbochargers, but close review of the figures reveals that the insulation material and arrangements are directed to portions of the diesel power plant *away from* a turbocharger. *See, e.g.*, Figs. 2, 4 (insulation of exhaust pipe fitting and flex joints; all downstream of any turbocharger). Thus, while the German word for "turbocharger" may be in the opening lines of the Wirth document, this reference clearly does not teach anything specifically directed to *turbocharger* insulation. At best, Wirth teaches only the general proposition that insulation may be used for both thermal protection and sound reduction for hot components *such as exhaust pipe* – a proposition which is so general as to provide absolutely no suggestion regarding any specific aspect of the present invention's secondary air turbocharger synthetic resin insulation over the turbine bearings.¹

¹ The bearings 12 and 13 shown in the O'Neill figures, as well as an additional bearing, not further identified, in the vicinity of the compressor 1, have no spatial relationship
(Footnote continued...)

As a result of the above, the combination of O'Neill with Wirth would not result in the recited *secondary air* turbocharger (or any turbocharger, for that matter) with "at least a portion of the housing being enclosed externally in the *area of the bearing assembly* by a sound absorbing insulating material of *synthetic resin foam* for noise suppression." Indeed, even if Wirth were combined with O'Neill, all that would result is a gas turbine engine with *internal* insulation which both protects turbine wheels and shaft bearings from hot burner chamber gases (O'Neill) *and* lowers noise (Wirth).

Because O'Neill is not analogous art, and because there is no suggestion or motivation to combine the O'Neill and Wirth references and no combination would result in the present invention as recited in claim 1, this claim and its dependent claims are patentable over these references under § 103(a). Reconsideration and withdrawal of the pending § 103(a) rejections is respectfully requested.

CONCLUSION

In view of the foregoing amendments and remarks, the Applicant respectfully submits that claims 1-11 are in allowable form. Early and favorable consideration and issuance of a Notice of Allowance for these claims is respectfully requested.

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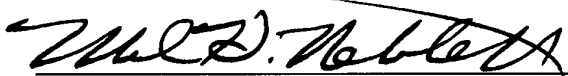
with the thermal insulation 14 of Fig. 1. Only the inner rolling bearing lies close to the thermal insulation 14, but it is disposed laterally thereof and not in the circumferential range, as recited in the present invention. O'Neill therefore teaches nothing regarding external insulation location over bearings

If there are any questions regarding this amendment or the application in general, a telephone call to the undersigned would be appreciated since this should expedite the prosecution of the application for all concerned.

If necessary to effect a timely response, this paper should be considered as a petition for an Extension of Time sufficient to effect a timely response, and please charge any deficiency in fees or credit any overpayments to Deposit Account No. 05-1323 (Docket #037/51119US).

October 19, 2004

Respectfully submitted,

A handwritten signature in black ink, appearing to read "J.D. Evans", written over a horizontal line.

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